Kentucky Method 64-313-03
Revised 2/14/03
Supersedes 64-313-00
Dated 1/13/00

MEASUREMENT OF BRIDGE DECK REINFORCEMENT COVER

1. SCOPE:

1.1. This method is a procedure for measuring the concrete cover over the top mat of steel reinforcement in bridge slabs. (NOTE: The contents of this method are the responsibility of the Bridge Section of the Division of Construction. The Division of Materials is responsible for printing and distribution of this method.)

1.2. The method of determining the deduction to be applied to deficient or excessive cover is also shown.

2. APPARATUS:

2.1. Pachometer: A magnetic probe attached to a meter that is capable of measuring the concrete cover on steel reinforcement. The device may be handheld or rolling. The R-Meter manufactured by James Electronics is the device currently being used.

2.2. Miscellaneous Supplies : 50' steel tape, keel and spray paint.

2.3. Structure Plans.

2.4. Traffic Control Devices: Appropriate signs, cones, and flags.

2.5. Sufficient personnel to operate the pachometer, take notes, and control traffic. Not including traffic control, a minimum of two people are required.

3. PROCEDURE FOR LAYING OUT GRID SYSTEM ON DECK FOR PACHOMETER READINGS:

3.1. The intent is to take the measurements on a slab grid system with points on 10 feet centers longitudinally and 5 feet centers laterally. When the slab length and width result in excess dimensions, then these excess dimensions are to be applied equally to both slab ends and both gutterlines. These grid points are marked on the slab. Spray paint should be used if the grid will be needed for an undetermined length of time.

3.2. On skewed bridges the first grid point for each grid line should be the same distance from the end of the bridge. The 5 feet distance between longitudinal lines should be at right angles to center line of bridge.

3.3. The overall length and width of the bridge slab shall be determined from plan dimensions. The slab width to be considered will extend from inside face of curb to inside face of curb. The slab length will be the "out-of-out" slab dimension indicated on the plans.

4. PACHOMETER OPERATING PROCEDURES: Attach the probe and cables to the meter. Turn the pachometer function selector to the run position. Depress the battery check button and insure the indicator reads to the right of the "Battery OK" position. After the pachometer has been allowed to warm up, hold the probe at least 24" from any metallic object and check the indicator position. If the indicator is not at the extreme left index line, move it to that position by turning the zero adjustment button as required. If the indicator is at the index line, move it to obtain a small plus reading and then return to zero.

5. PROCEDURE FOR TAKING PACHOMETER READINGS:

5.1. Check the design plans for size of the top reinforcement bars in the deck. (Some bridges may have skewed transverse steel and some short span bridges may have a horizontal top bar.) If the bridge has two different sizes of transverse bars, note both sizes.

5.2. Prepare a chart or table for recording the pachometer readings. Align the probe parallel to the axis of the top-most reinforcement and move it at right angles to this alignment. Move the probe across the grid point and on until at least the second bar of the top mat is measured. Once the bar is located stop the probe over a bar to allow the needle to stabilize before reading. Record the most shallow indication observed for the size of reinforcement. Continue this procedure at all grid points until all readings are recorded. Check the zero adjustment of the scale indicator frequently; when required make zero adjustments as previously mentioned.

5.3. Occasionally dust and debris will accumulate on the magnetic probe, which will require cleaning of the probe. This accumulation will affect the zero adjustment, and the actual reading of the cover.

5.4. Erratic movement of the dial needle may indicate the presence of a foreign metallic substance (nail, tie wire, metal filings) on or near the slab surface. As foreign materials may be within the grooves of textured surfaces, the deck should be thoroughly cleaned to remove such materials as would affect the pachometer readings.

6. EVALUATION OF PACHOMETER READINGS:

6.1. After all readings are recorded they should be reviewed while still on the jobsite. If all readings are within 1/4" of the specification tolerances then no further field action is required, and no deductions will be made. If recorded readings are not within 1/4" of the specification tolerances then mark a minimum of three bar locations on the bridge deck for removal of cores. Extremely long bridges or phased construction may dictate more cores. These bars should be among those already read and should represent marginal bar cover or cover outside of specification tolerances. After these bars are relocated their locations are marked with spray paint and the grid number painted close by. The spray mark should be no longer than 12" and as narrow as possible to accurately locate the bar.

6.2. The Division of Materials will be notified by the Central Office Bridge Construction Engineer that bar depth cores are required. The Division of Materials will take partial cores to determine actual top mat cover at the marked locations. These cores will generally extend down to the top steel and be broken off, showing an impression of the rebar. The Division of Materials will bring these cores to the Materials Central Laboratory and report to the appropriate Division of Construction representative concerning the measured bar depths. These cores will be turned over to the Division of Construction and kept until final release of the project. The contractor is welcome to review the cores.

6.3. The Division of Construction representative will evaluate the core measured bar depths and make appropriate adjustments to the pachometer readings. If one set of cores is taken to represent deficient cover and another set for excessive cover, then different correction factors may be employed for each. The pachometer is more sensitive or accurate at the shallower readings. However, if the cores represent generally the same range of cover, and the cores indicate different margins of error, then the contractor shall be given the benefit of doubt for the correction factor to be used. Differing margins of error will not be averaged.

6.4. Occasionally the Division of Materials will not fine a bar at the designated location. If the penetration of the bit extends to 3 inches beyond the theoretical plan depth without evidence of a bar, the coring shall cease, and the core shall be removed and thoroughly inspected. If no evidence of a bar is noted, no further cores shall be taken at this location. Coring at other marked locations will proceed. It is of no value to take a core at a location where no pachometer reading exists. All core holes shall be filled with non-shrinking grout by the contractor.

6.5. After core indicated adjustments have been applied to all pachometer readings, the pachometer readings will be evaluated and any areas which require penalties in

accordance with Section 609.18 of the Standard Specifications will be determined and the penalties will be calculated by using the adjusted cover readings.

6.6. All areas of the same deficiency will be summed and the appropriate deduction factor applied. The total deduction is calculated in accordance with the following formula:

$Vd = Af / As \times Vs \times F$

Vd = Total Volume Deduction

Af = Total Factored Area

As = Total Slab Area Between Gutterlines (No deduction for drains, joints, etc.)

Vs = Total Slab Volume Between Gutterlines*

F = Deduction Factor

* For slab span bridges, a maximum depth of 8 1/2" will be used in computing the slab volume.

The attached example is provided as a guide.

APPROVED _____
Director
DIVISION OF MATERIALS

DATE 2/14/03

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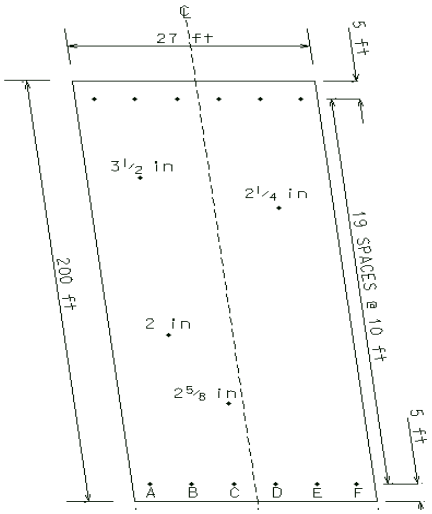
Attachment Km31303.doc

EXAMPLE



Given : 2000 Specifications
Plan Cover = 3”
Deck Depth = 8 ½”
Deck Dimensions = 200’ x 27’
Skew = 20°
5’ Space of longitudinal line = 5’ ÷ cos 20°
= 5.32’

Cores Required

Grid	Pachometer Depth	Core Depth	Diff.
5C	2 5/8”	2 ¾”	+1/8”
9B	2”	2 1/8”	+1/8”
12E	2 ¼”	2 ½”	=1/4”

Add ¼” to all deficient cover depths and 1/8” to all excessive readings

Total Slab Volume =(200’ x 27’ x .708’) ÷ 27 = 141.6 yd^3
Total Slab Area = 200’ x 27’ = 5400 ft^2

(1) Grid 5C = 2 5/8” + ¼” = 2 7/8” (within specification tolerances)

(2) Grid B = (2” + ¼” = 2 ¼”) Factor = .25 (Section 609.05)
Area = 5’ x 10’ = 50 ft^2

$$V_d = \frac{A_f}{A_s} \; x \; V_s \; x \; F = \frac{50 \; ft^2}{5400 \; ft^2} \; x \; 141.6 \, yd^3 \; x \; .25 = .33 \; yd^3$$

(3) Grid 12E = 2 ¼” + ¼” = 2 ½” (within specification tolerances)

(4) Grid 17B = (3 ½” + 1/8” = 3 5/8”) Factor = .12

Area = 5’ x 10’ = 50 ft^2

$$V_d = \frac{50 \; ft^2}{5400 \; ft^2} \; x \; 141.6 \; yd^3 \; x \; .12 = 0.16 \; yd^3$$